Pineview Estates – Gardnerville Nevada

Overview

Pineview Estates currently consist of 193 homes that are serviced by three (3) advanced onsite wastewater treatment systems. Circuit Rider David Wallis stopped by the Pineview Estates during the early evening of June 2, 2009 to locate the site. The community appeared to be nearly fully occupied with cars located in nearly all driveways and had minimal available street parking due to the large volume of cars parked on the streets. Homes may possibly be vacant but this could not be verified.

All flow can be rerouted to the any of the three treatment systems. There were three lift stations observed during the site visit. The original wastewater treatment systems A1 and A2 were installed by "Loomis" and may date back 15 years. Houses were connected to the system as development occurred. Accurate as-builts of the older components and connections to the sewer disposal system from homes are not available

Knox excavation has been trying to locate, repair and determine how the original systems were installed and connected to the disposal systems but is uncertain about the installation and actual discharge points of many of the homes.

Each home is suppose to have its own septic tank to act as a primary settling tank and it is the homeowner's responsibility for pumping and maintenance.

The three advanced wastewater treatment units were installed four year ago-2004-2005

The site visit was conducted starting at the lowest elevation treatment system "A1" leach fields and lift stations and working towards the highest elevation treatment system "B"and its associated disposal system.

Discussion and Recommended Suggestions

Sampling-labeling

There is a need to improve the sampling protocols, labeling and sampling techniques in order to provide consistency in the laboratory – reporting results. Although there have been different samplers collecting the results during the past six months, after discussion with Brenda Stein it appears sampling is not the primary reason for results above the design and discharge parameters. The individual who was collecting the samples prior to the last six months was brought back to collect samples and elevated results above the design and discharge parameters still occurred.

Suggested Recommendation:

- Attach or install permanent labeling on or immediately adjacent to the designated sampling location
- Establish a written protocol for collecting samples at all locations at Pineview Estates

- The discharge from wastewater treatment system A1 and A2 should most likely be sampled and analyzed, in particular treatment unit A1 which is approaching maximum design capacity. Samples could be collected from these units by unscrewing the access hatch nearest to the discharge of the treatment unit and dipping a sample out.
- If a new sampler is to collect samples at Pineview Estates insure they receive training
- Insure that the laboratory chain of custody forms are labeled as the permanent labeling on the sample site identification

Laboratory accuracy

In general the laboratory results have been consistent with some notable exception
And I only have looked at 4-5 months of discharge results from Pineview.
There are problems I believe that may be typos or mathematical errors from the lab.
The laboratory had an 1800mg/L suspended solids and a 200 BOD mg/L on the same sample- it just doesn't occur in domestic wastewater typically. TSS and BOD have some correlation range probably no more than a 2-3 to 1 ratio typically. A 9 to 1 ratio seems unreasonably elevated.
The most recent result has a 430 mg/L TKN. This just doesn't occur in domestic waste water-it doesn't happen. I suspect it probably should have been 43mg/L of TKN
Most of the other results were within the 30-50 mg/L of TKN on the monthly results.
Brenda Stein mentioned that the lab had not been very responsive to her inquires about results.

Suggested Recommendation

- Establish verbal and written communications with the laboratory to insure that the results are review promptly when concerns arise.
- Consider collecting and splitting samples, send to additional laboratory to verify results of current laboratory

Flow Meters

All of the 4" flow meters have been installed into a U-shaped piping configuration. Although this will insure that the meter is full of water at all times which is a requirement for proper operation of a magmeter. This piping configuration also would tend to collect debris and interfere with proper flow measurement. The 4" magmeter and the low flow velocities create a condition that would be challenging to accurately measure.

The flow meters accuracy needs to be verified by a certified technician
The flow meter for treatment system A1 was buried and not accessible for calibration currently
The flow meter for treatment system A2 was non-functional but accessible for removal from a circular vault
The flow meter for treatment system B functional and accessible for removal from a circular vault

Suggested Recommendations:

- Have flow meters calibrated and certified by a qualified technician with meters installed in place onsite at Pineview Estates

Actual wastewater flow

Accurate knowledge of the wastewater flow rate and organic loading into the treatment units is essential for proper operation of the treatment systems.
The current population is unknown but some estimates can be made and calculations performed to estimate interior water use which is discharged to the sewer. There are 193 homes at Pineview. There are some vacant homes at Pineview. Mr. Tom Robinson stated that there were 16 vacant homes. With an average of 2.5 persons per home, which Mr. Jim Robinson thought was a low figure which was based upon his personal knowledge of living in the development He thought that most likely would be closer to 4 persons per home. Using an average interior water use of 77gpcd, this is for a fully equipped low flow rate fixture home. Wastewater flow at Pineview would be the following

193 homes – 16 vacant homes = 177 occupied homes

Calculated flow – low population estimate
177 homes X 2.5/population/ per home X 77 gpcd = 34,072 gallons per day

Calculated flow – high population estimate
177 homes X 4/population/ per home X 77 gpcd = 54,516 gallons per day

Current measured flow
8,000gpd /A1 + 714 gpd / A2 + 17,000 gpd = 25,714 gallons per day

Gpcd= gallons per capita per day

Home Owners septic tank –solids build up and pumping

The Pineview Estates wastewater treatment plan incorporates a primary settling tank-septic tank at each of the 193 homes. This design certainly has many features that are positive such as; less initial loading into the wastewater treatment plant, less expensive lift station pumps, less potential for sewer stoppages and isolation of non biodegradable substances at the source. Unfortunately there are a few drawbacks: odors potentially at 193 homes and most importantly the requirement to occasionally pump the 193 homes primary settling –septic tanks. Unfortunately if these septic tanks are not pumped on some routine basis the potential for increased organic loading to the secondary- advance wastewater treatment facilities will occur. This will at some point, due to degradation of waste in the septic tanks, have a pass through effect of materials due to excessive build up in the septic tanks; there is no requirement of homeowners to pump these tanks, nor any homeowner's ordinance to address this issue.

Suggested Recommendation:

- An onsite wastewater management plan needs to be adopted with an ordinance developed to address properly monitoring waste in the septic tanks. When solids reach a threshold level, required pumping should be conducted to reduce loading to the advanced biological treatment systems.

Primary settling tank at Treatment plant 'B'

This treatment unit was pumped several months ago for the first time since plant start up four years ago. Routine monitoring of this treatment unit needs to be performed on a monthly basis and logged. This tank should be pumped when the volume of sludge in the bottom of the tank and the volume of the surface sludge equal approximately 25% of the entire primary settling tanks volume by depth.

Recommended Suggestion

- Monitor solids, log solids and pump when required

Influent Characteristics

Additional monitoring of the "B" treatment system influent needs to be conducted to insure there are no limiting parameters for biological treatment and nitrification. If monitoring indicates possible performance limiting factors to a biological process, additional sampling should be performed at treatment systems A1 and A2

Recommended Suggestion

- Monitor the influent for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), alkalinity, oil and grease, pH

Wastewater Treatment plant actual capacity

The manufacturer Bio-Microbics" had very limited technical response to any questions posed to them during numerous phone exchanges and via e-mail. With that said examining data that is available on the manufacturer's web site the "B" treatment is designed to treat waste from a population of 504 persons. The current population at Pineview is estimated at 442 to 708. This population estimate was calculated using either 2.5 to 4 persons per home using only 177 homes.

Currently all flows from the Pineview Estates is being routed to the "B" system and the "A1" and "A2" system are isolated and offline.

Nitrogen Removal

The Pineview Estates construction blueprints indicated that four Nitrifast 9.0 were intended to be installed as the wastewater treatment system for the Pineview Estates. m. The Nitrifast units were intended for enhanced nitrogen removal rates. Discussions with the manufacturer indicate that the Nitrifast 9.0 units were in fact not installed and that Microfast 9.0 units were installed

Examining data at the manufacturer's website as well as other sites where studies have been performed with the Microfast Units there seems to be little chance of the current treatment units successfully consistently achieving a 10mg/l Total Nitrogen level in the effluent discharge. During colder winter weather months there appears to be no chance of achieving a 10mg/L Total Nitrogen.

Treatment plant - settling tanks, treatment tank, final clarifier

During the site visit there was no sludge judge available or other device to measure the actual sludge build up in any of the treatment tanks. Two significantly different sets of sludge depths were stated by the Robinson father and son. Mr. Jim Robinson stated there was 10-12" in the settling tanks and clarifier while Mr. Tom Robinson stated there was 18-24". The second set of sludge depths figures of 24" would indicate that pumping of solids should be performed. Both gentlemen indicated that the treatment tanks had never had solids removed. Conversation with Mr. Tom Robinson seemed to indicate that the homeowners association did not have the resources currently to perform solids removal from the treatment systems.

Recommended Suggestion

- All treatment units should have excess solids remove via pumping

Air Venting

The air venting which appears to be an important feature to avoid excessive backpressure and adequate air flow in the Bio-Microbics FAST 9.0 treatment unit were not installed per specifications. The manufacturer recommends a 10" minimum vent pipe and a recommended construction specification for a 12" vent. The Micro Fast treatment unit that was inspected visually only had a 6" diameter vent pipe.

Minimum Vent Pipe Size Per FAST Unit Size

- 0.5, 0.75, 0.9 =	3" vent pipe
- 1.0, 1.5 =	4" vent pipe
- 3.0 =	6" vent pipe
- 4.5 =	8" vent pipe
- 9.0 =	10" vent pipe

Recommend Suggestion

Install vents on all treatment units per the manufacturer's specifications

The three advanced wastewater treatment units were installed four year ago-2004-2005 The site visit was conducted starting at the lowest elevation treatment system "A1" leach fields and lift stations and working towards the highest elevation treatment system "B" and its associated disposal system

Observations, Notes and General Site Information

Treatment System - "A1"
Lowest Elevation on the development site-adjacent to Highway 395
Rated for 9,000 gpd
Current flow 8,000gpd
Treatment tank volume -16,000 gallons

A1 was receiving 8,000 gpd per the 4"-- "Ultramag" Model MX04- magmeter
There was no way to observe the meter installation. The meter may have been directly buried. The magmeter should be installed in a large vault that is accessible and of sufficient size to facilitate in-place calibration and cleaning of the meter and adjacent piping. The calibration should be performed by a certified technician and records kept on site.

This system had been receiving much higher flows in the past. A duplex lift station was installed to divert a significant portion of the flow to the "B" system which is much larger and located up gradient of the site. A portion of the flow into the duplex lift station is now diverted to the A1 treatment system for discharge in to the A1 effluent disposal fields

Sampling from the advanced wastewater treatment unit effluent discharge was not occurring

The A1 disposal fields that were in service were installed during the original site development. The disposal fields are approximately 60 feet in length, 10 feet deep and 3 feet wide. They are a pipe and gravel system with the gravel rock extending completely to the surface.

There was 3" of water in the inspection port during the time of the site visit.
A noticeable "L" shape pattern of plant growth was noticed down what appeared to be the primary distribution main to the disposal fields and one of the perpendicular laterals. There was no plant growth visible on any of the other laterals surface.

Water was observed in a drainage ditch directly adjacent to the disposal fields in an easterly direction. There had been some light rain the night prior. But plant growth seemed to indicate water had been present for a longer period of time.

The disposal fields are located on an area with moderate slope

There was a significant number of disposal fields that were said to have been disconnected and abandoned that were up gradient of the active disposal Field A1

There were two monitoring wells located adjacent to Field A1
The monitoring wells were stated to be 50 feet deep
Monitoring Wells:
A3 –which is located on the uphill gradient side of the A1 field
A4 – which is located on the downhill gradient side of the A1 field

Treatment System - "A2"
Mid Elevation on the development site-adjacent to Highway 395
Rated for 9,000 gpd,
Currently flow 2-5,000 gallons per week
Treatment tank volume -16,000 gallons
A2 was receiving 2-8,000 gpd per the 4"-- "Ultramag" Model MX04- magmeter
The magmeter on system A2 was not functioning
Mr. Robinson took this field out of service during the site visit.
The magmeter had just been repaired and reinstalled prior to the current failure
The meter installation had been installed in a vault that would allow for removal and replacement of the meter. The meter had been piped into a u-shaped configuration that insured water was present at all times in the meter for proper operation. Unfortunately this would also allow for debris to collect and potentially cause meter error. The meter could not be field checked or calibrated as it is currently installed. Mr. Robinson stated there was proper straight pipe installed upstream and downstream of the meter to insure a laminar flow pattern would be entering the magmeter. The magmeter should be installed in a large vault that is accessible and of sufficient size to facilitate in-place calibration and cleaning of the meter and adjacent piping. The calibration should be performed by a certified technician and records kept on site.

Sampling from the advanced wastewater treatment unit effluent discharge was not occurring

The A2 disposal fields that were in service were installed during the original site development. Currently per Mr. Robinson the system was only providing service to 11 homes. The A2 disposal system consisted of approximately 15 disposal field laterals that are approximately 60 feet in length, 10 feet deep and 3 feet wide. They are a pipe and gravel system with the gravel rock extending completely to the surface. The exposed gravel had been covered with a mound of dirt. Surface percolation had been a problem in this field.

The A2 system had approximately 15 laterals
The disposal fields are located on an area with moderate slope

There were two monitoring wells located adjacent to Field A2
The monitoring wells were stated to be 50 feet deep
Monitoring Wells:
A1 –which is located on the uphill gradient side of the A2 field
A2 – which is located on the downhill gradient side of the A2 field

Lift Station Stations-

The three lift stations observed were are installed properly, well kept and clean, alarmed and functioning properly

Lift Station B1

This duplex lift station is located uphill and near treatment system A2
The control panel for this lift station is located on the rear of one of the sub-divisions potable drinking water well and treatment building.
The wet well for this lift station is located within 20 feet of one of the sub-divisions two primary drinking water wells

Lift Station B2

This duplex lift station is located directly behind Mr. Robinson home and adjacent to the road entering the sub-division"Ray May Way. The control panel for this lift station is located in a fenced in secure area. There had been a problem with some minor sewage seepage around a pipe penetration mortar in the wet well that bled into adjacent detention pond. There had been some minor seepage -odor, the problem was reported to USEPA and Mr. Robinson corrected the seepage problem. Investigations and sampling by Nevada EPA into this seepage –odor event six months after its occurrence apparently have not yielded any further data. A green area that was above the normal water level of the detention pond was explained to be occurring because a natural drainage had been filled in un-compacted and natural moisture migration through soil occurred at this point. Monitoring Well #B4 is located directly up gradient of this area and no evidence that seepage from the up gradient "B" leach field system has been detected.

Lift Station B3

This duplex lift station is located adjacent to treatment system A1
Flow from this lift station can be sent to treatment systems A2 and B and a portion of the flow is routinely diverted via gravity to treatment system A1.

Treatment System B

This is the largest of the three advanced wastewater treatment system at Pineview Estates.
The treatment system is designed to treat a flow of 36,000 gallons per day
Current flow is approximately- 17,000 gallons per day

The treatment system consists of:

1- 4" Mag Flow meter
1- 4,000 gallon Primary settling tank
1- 4 channel-pipe outlet distribution box to the treatment units
4- 9,000 gpd Bio-Microbics Nitrifast treatment units
4- Non functional, in- line UV disinfection units- with two lamp assemblies each
1- 6 channel-pipe outlet distribution box to the dosing siphons
6- 5000 gallon dosing tanks with 3,000 gallon dosing siphon – dosing siphons disabled
** When dosing siphons were initially installed, surfacing of treated wastewater occurred due to low percolation
Each dosing tank is piped to feed two disposal fields
6- Dosing counters/ non functional and two isolation valves on dosing tanks-one for each disposal field

Effluent Disposal Area

Consist of 12 individual disposal fields with 6 laterals each. Labeled F1 to F12

Even numbered fields 2-12 are located closet to Highway 395
Odd numbered fields 1-11 are located closet to "B" treatment plant
Fields F2-12 and Field F9 had been in service since December 2008

Fields F5-8 percolates to surface
Fields F6 and F8 are shutoff to even flow due to this
Wastewater percolates below the surface evenly and down gradient throughout the area
With fields F6 and F8 secure

There were four monitoring wells located adjacent to Field "B"
The four monitoring wells encompass each side of the rectangular shaped disposal area "B"
The monitoring wells were stated to be 50 feet deep
Monitoring Wells:
B1 –which is located on the uphill gradient side of the "B" field
B4 – which is located on the downhill gradient side of the "B" field
B2 – which is located on the west side, mid point, closet to Highway 395
B3 – which is located on the east side, mid point, closet to Mark Street

Knox Excavation installed site drainage to prevent flooding of the "B" disposal area from rainwater and runoff

Recommended Suggestion:

The “B” treatment system flow measurement magmeter should be installed in a large vault that is accessible and of sufficient size to facilitate in-place calibration and cleaning of the meter and adjacent piping. The calibration should be performed by a certified technician and records kept on site.

Involve Parties

PTP Developers-
Leon May
Ray May- deceased

EXD Engineering- contract coming to an end with PTP Developer
Brenda Stein-775-783-4772
Works for developer- handles environmental compliance-monitoring

Knox Excavating- installed the 3 advanced wastewater treatment systems-
The biological wastewater treatment systems were manufactured by -“Bio-Microbics”
Many of the components and tanks for the treatment system were generic that were specified per the construction contract and not manufactured by - -“Bio-Microbics”
Jim Robinson-Foreman- UIC Operator-Contracted Operator 1-775-691-1002
Tom Robinson-Owner

Pineview Homeowners Association
No contact person or information

WETLAB
Contract Environmental Laboratory 775-355-0202

Table 4.

Summary of Septic Tank Effluent Quality
Data and Approximate Percent Reduction
Parameter Mean Effluent Approx. Reduction

Parameter	Effluent Concentration	Percent Reduction (%)
T. Phosphate	20 mg P/L	15 %
COD	200 to 327 mg/L	60 to 70 %
BOD 5	120 to 140 mg/L	40 to 50%
Suspended Solids	39 to 155 mg/L	40 to 80 %
T. Nitrogen	36 to 45 mg/L	0 to 50 %
Oil and Grease	20 to 25 mg/L	70 to 80%

Source: US EPA, Design Manual: Onsite Wastewater Treatment and Disposal Systems, October 1980

Table 1. Increase in pollutant loading caused by addition of garbage disposal

Parameter	**Increase in pollutant loading (%)**
Suspended solids	40 - 90
Chemical oxygen demand	20 - 65
Total nitrogen	3 - 10
Total phosphorus	2 - 3
Fats, oils, and grease	70 - 150
Sources: Hazeltine, 1951; Rawn, 1951; Univ. of Wisconsin, 1978; USEPA, 1992.	